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ABSTRACT

The relationship between children's knowledge of particular situations and their comprehension of stories about them was investigated. Children in kindergarten and grades two, four, and six heard stories about differentially familiar situations and then answered questions. "Scripts," characterizing knowledge about stereotypical events, were obtained from each child. Results supported predicted relations between scripts and comprehension. Children who had adequate scripts comprehended explicit and implicit story forms equally well. All children had good comprehension of stories about highly familiar events, but kindergartners performed more poorly on stories concerning less familiar situations. Sixth graders did significantly better than younger children on unfamiliar stories. (Author)

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The Influence of World Knowledge on Children's Comprehension of Short Narrative Passages

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The Influence of World Knowledge on Children's Comprehension of Short Narrative Passages

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The research reported in this paper was part of a larger study designed to explore the possible influence of two factors on children's comprehension of simple stories. One of these factors is the amount of knowledge a child may have about the particular situation described in a story. The other is the degree to which children may be aware of their own level of understanding and consequently make deliberate efforts to assure comprehension of a passage. This paper will focus on the investigation of the first factor: the effect of children's existing knowledge on comprehension.

The rather widespread observation that comprehension of discourse involves some kind of interaction between what people know and the information in a passage has remained largely untested for several reasons. Though the influence on prose recall of world knowledge has consistently been demonstrated through the use of context-setting titles (Bransford & Johnson, 1972; Dooling & Lachman, 1971; Schallert, 1976), investigators have lacked theoretically interesting and empirically useful ways to characterize people's existing knowledge, as well as appropriate analytical tools to describe the structure and content of texts. Additionally, studies of language processes until recently have usually concerned sentence-level phenomena rather than connected discourse. This situation, however, is changing.

Several theorists have, by now, suggested that human knowledge might be characterized as being stored in interrelated networks of variables representing stereotypical events, experiences, or concepts (e.g., Rumelhart & Ortony, 1977). Such networks have variously been called "frames"

(Charniak, 1975; Minsky, 1975), "scripts" (Nelson, 1977; Schank & Abelson, 1975), and "schemata" (Anderson, 1977; Rumelhart & Ortony, 1977). The suggestion that story comprehension may involve the successive evocation of systems of this kind has received at least some experimental validation (Anderson, Spiro, & Anderson, 1977; Thorndyke, 1977).

The role of existing knowledge may be particularly important for examining developmental differences in children's prose comprehension. Various studies have shown that certain syntactic structures are difficult for school-aged children to understand (Bormuth, Manning, Carr, & Pearson, 1970; Chomsky, 1969; Lesgold, 1974; Richek, 1976), but syntax alone apparently cannot account for observed age differences. Indeed, Gowis & Powers (1972, in press) have shown that comprehension of syntactic forms, itself, is influenced by children's extra-linguistic expectations derived from their beliefs about the world. Other research indicates that even preschool and primary-grade children can reconstruct story order (Brown, 1975) and actively construct or infer some implied semantic relationships (Brown, 1976; Hildyard, 1977; Paris & Carter, 1973; Paris & Mahoney, 1974), provided they have the requisite world knowledge and the task demands are consonant with their developmental level. However, studies by Markman (1977) and Paris & Lindauer (1976) suggest that younger children do not habitually make use of deliberate comprehension strategies or realize the extent of their own lack of understanding. Thus existing theory and evidence implicate both existing knowledge and conscious strategies or plans as factors in the comprehension of prose and suggest that developmental differences in both these factors may affect comprehension at various ages.

In this paper, Schank & Abelson's (1975) notion of a "script" has been utilized to represent the knowledge someone may have of a familiar

event. For these authors, a script is, "... a predetermined, stereotyped sequence of actions that define a well-known situation." The idea of a script, if it has psychological validity, might be able to illuminate the relationship between a person's existing knowledge and the information in a passage. If a story concerns such a familiar, stereotypical situation and a child or an adult has the corresponding script for this experience, the information in this script might then be used in the comprehension of the story, as by providing details or supplying connecting links which are not explicitly mentioned in the passage. Thus, a story can refer to objects or events without prior mention of them if they are normally part of the appropriate script, and comprehension of them will not suffer (Schank & Abelson, 1975).

This study sought to examine the relationship between a child's existing knowledge and the "familiarity" of the content of a story. Specifically, it was predicted that no significant differences in comprehension might occur developmentally with stories about situations that were well-known even to preschool children, since children could simply utilize what they already knew about such situations to understand them. Furthermore, provided children had the appropriate scripts, no comprehension differences were expected between passages that contained all essential script information ("explicit" forms) and those in which certain information presumed to be in the script had been deleted ("implicit" forms). Children without the requisite knowledge, however, were predicted to do better on the explicit passages. If a story concerns a topic that is even partially unfamiliar, however, something other than existing knowledge is probably needed for comprehension. Children may need to know that they have to do something in order to understand and then be able to do it (Brown, in press; Markman,

1977). Older children should be better monitors of their own comprehension than younger children. Therefore, substantial grade-level differences were predicted for stories about which children were expected to have little available conceptual knowledge.

Method

Materials

The influence of world knowledge on children's comprehension was investigated by constructing short narrative passages about situations which were judged to vary in the degree to which they would be familiar to children at different ages and establishing "script-lists" for more familiar episodes. Any available sources, such as existing research and parents of young children, were first consulted for ideas for events that might be differentially known to five- or six-year-old children. On this basis, three situations - eating at a fast-food restaurant, shopping in a supermarket, and making a peanut butter-and-jelly sandwich - were selected as likely to be highly familiar even to the youngest group. Two other events - playing checkers and growing vegetables in a garden - were expected to be more familiar to older children and differentially known to children within any age group. (A third kind of story used fictitious concepts to present novel instances of stereotypical situations in order to see how children could deal with generalized "script" information. Results pertaining to these stories are not included in this paper.)

Children in the first and fifth grades were then asked to tell all they could about these situations in order to assess their familiarity with them and to provide one basis for determining what invariant sequence of events such situations should include. A group of adults was also requested to provide written accounts of these activities, while paying attention to

those things they considered to be invariant. After comparison and analysis of the information from both the children and adults, tentative "script-lists" were prepared. These lists were then tried with eight children each from kindergarten and the second, fourth, and sixth grades, and adjustments were made where problems or inconcistencies occurred.

Insert Table 1 about here

On the same basis, stories containing all essential information were composed for the supermarket, peanut butter-and-jelly sandwich, checkers, and garden situations. These served as the "explicit" forms. (Eating in a fast-food restaurant was used as the practice script for all subjects.) The explicit stories were then given to college students who were asked to eliminate extraneous sentences, or those which contained information that was implied by or could be inferred from the remaining sentences in the passage. This procedure was repeated, with adjustments, until at least 85% agreement on deletions was obtained for each story. The "reduced" forms served as the "implicit" versions of the stories. Stories were also written about two situations which were judged to be very unfamiliar to elementary-school children. making lye soap and making a silk-screen print. These stories had only explicit forms. Each form of each story was recorded on a cassette tape in a normal speaking voice by an adult female who had had extensive experience as a teacher of young children.

Initially, six "script" questions and two "passage" questions were written for each of the first two kinds of stories, while eight questions were prepared for the "unfamiliar" stories. "Script" questions pertained to information that could be in the script which corresponded to a story; they served as the basis for comparisons between explicit and implicit story

forms. "Passage" questions referred to specific information, such as the name of a person, which was added to make the stories more like typical narratives. The stories and questions were pilot tested with eight students each from kindergarten and the second, fourth, and sixth grades, and changes in questions were made on the basis of the pilot data. Two additional "passage" questions per story were also added, making a total of 10 questions for each story. More students knew about making silk screen prints than anticipated, so a story about making a lithograph was substituted in subsequent testing. Two sets of stories were then compiled. One set contained the supermarket, checkers, and lye soap stories; the other, the peanut butter-and-jelly, garden, and lithograph stories.

Subjects

Twenty students each in kindergarten, and the second, fourth, and sixth grades participated in this study. They were native speakers of English who attended public elementary schools and a middle school in a semi-rural school district in southeastern Pennsylvania. Second, fourth, and sixth graders were randomly selected from those students who scored above the 10th percentile and below the 90th percentile on the reading comprehension section of the Metropolitan Achievement Tests. Kindergarten children were chosen from those designated by their teachers as being in the middle range of ability in their class. The kindergarten and second and fourth-grade groups were each composed of 10 girls and 10 boys; the sixth-grade group consisted of 13 girls and seven boys.

Procedure

Each student was seen individually by the experimenter in a session which lasted between 45 minutes and an hour. All protocols were recorded on

cassette tapes. In addition, written records were kept on prepared booklets. Script knowledge was obtained first. Following practice on the fast-food restaurant script, each child was asked to give as much information as possible about the episodes in his or her story set. Non-specific probes were used to elicit information that was not provided spontaneously. Responses were compared to those on the appropriate "script-list." For those situations which were expected to be unfamiliar (making lye soap or making a lithograph), students were merely asked whether they knew anything about these events. Each student then listened to one form of one of the first three kinds of stories (highly familiar, less familiar, and general) and one of the "unfamiliar" stories. (Preliminary testing had revealed no differences between reading and listening conditions for fluent sixth-grade readers, so oral presentations were used to avoid having word recognition ability influence comprehension.) An equal number of children in each grade heard each form of each story. The order of presentation of the first three kinds of stories was counterbalanced; the "unfamiliar" story was always presented last since it was thought to be the most difficult. Students heard each story twice in order to reduce memory constraints; they were also permitted to ask questions. The comprehension questions about each story were given after the second presentation.

Results

Scoring

The proportion of invariant script items mentioned by each child for each script was recorded. Arc sine transformations were performed on these proportions for later analyses. Adequate responses to the comprehension questions on each story were determined, and students were scored

for the number of both script questions and passage questions correct. Questions on the fourth level or "unfamiliar" stories could receive scores of 0, 1, or 2; thus scores of 20 points on these stories were possible.

Scripts

The transformed script proportions were analyzed with a 4 (school grade) x 2 (script-set: an artifact of the procedure; in itself of no interest) x 3 (familiarity level) factorial design, with repeated measures on the last factor. The main effects of grade, script-set, and familiarity level were all significant, although the data did not meet the homogeneity of variances assumption of the model. Script knowledge of the most familiar situations was nearly perfect across all grade levels. Only two items were missed by kindergarten students, one each in the supermarket

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Insert Table 2 about here

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and peanut butter-and-jelly scripts. One item (in the supermarket script) was omitted by a fourth-grader. As predicted, children did have substantially less knowledge of the situations presumed to be less familiar (playing checkers and growing vegetables in a garden), and this was especially the case with the younger children. Planned comparisons, using Kirk's t-statistic (Kirk, 1968) for a priori contrasts, showed that kindergartners knew significantly less about these events than children at any other grade. Second-graders' script knowledge was significantly less than that of the sixth-graders, but students at the upper two grade levels (fourth and sixth) did not differ from each other. Few omissions were made by the sixth-graders on either script. No student at any grade revealed any specific knowledge of the making of lye soap or the making of a lithograph.

Stories

The relationship between script knowledge and the comprehension of related questions on the explicit and implicit forms of the stories was to have been assessed by an analysis of covariance, using the transformed script proportions as the covariate; grade level, story, and story form as between-subject factors; and familiarity level as a repeated measure. However, because script knowledge of the familiar situations was so close to perfect for all students, this was not possible. Inspection of the number of script questions correct for the supermarket story showed that only two items were missed in all, one each at kindergarten and second grade, both on the implicit form. Results for the peanut butter-and-jelly story were similar except at kindergarten; one fourth grader missed one implicit-form question. Kindergartners, however, made a total of eight errors, two on the explicit form and six on the implicit form of the story. Mean numbers correct were 5.6 and 4.8, respectively (out of a possible six). This difference was significant on a two-tailed *t*-test, with $\alpha = .02$. Most of the errors, however, were on one item, which may have been judged incorrectly to have been a script-related question.

Sufficient (and sufficiently similar) variance for both script knowledge and story comprehension existed at kindergarten and second grade for analysis of covariance to be performed with the less familiar stories. A *t*-test had revealed no difference between the two stories, so data from the two were combined in the analysis. The transformed script proportions served as the covariate, with grade and story form as between-subject factors. Main effects were tested at $\alpha = .03$, since, conceptually, this analysis was part of a larger design. With the means adjusted for script knowledge, the difference between explicit and implicit story forms was not significant.

However, second graders, overall, had significantly better comprehension than the kindergarten students, $F(1,35) = 8.94$, $p < .005$.

A 2 (grade) x 2 (story form) analysis of variance was used to assess the difference between explicit and implicit forms at the fourth and sixth grades. Again, the homogeneity of variance assumption was not met, since the sixth graders made no errors on the explicit form. With $\alpha = .03$, no grade effect was found, though the main effect for story form approached significance. Among 20 subjects in both grades, only one error occurred for the explicit stories, while the 20 students who heard the implicit forms made eight errors (out of 120 possible). Analysis of the four "passage" questions at each level showed that the kindergarten children answered fewer questions correctly than any of the older students, who did not differ from one another.

Analysis of variance of the comprehension scores on the "unfamiliar" stories produced significant main effects of both grade and story. The lye soap story was easier than the lithograph story at all grade levels.

Insert Table 3 about here

Newman-Keuls tests, performed at the .01 level, revealed that the kindergarten scores were significantly lower than any of the others, and the sixth-grade scores were significantly higher than the others. The second and fourth graders did not differ from one another.

Discussion

Because of the problems encountered in meeting the assumptions of the statistical models employed, results of these analyses must be interpreted with caution. However, the reason some of these assumptions were not met

is the same reason that inferential procedures may not be needed to interpret much of the data. Some of the results are prima facie apparent. Clearly, those situations presumed to be most familiar were very well known to even the youngest children in this study, and in the case of the supermarket story, at least, this knowledge permitted students in each grade to respond to questions about the implicit forms as accurately as they did to those about the explicit forms. This was not true of kindergartners who heard the implicit version of the peanut butter-and-jelly-sandwich story, although, as mentioned, the significantly poorer performance of these children seems to have been produced by one anomalous item which was not specifically assessed on the script-list.

Expectations concerning knowledge of those situations thought to be less familiar were accurate. Kindergartners did know less about them than students at any other grade level, and second graders were not as well acquainted with them as the oldest children. In addition, even when comprehension scores were adjusted for script knowledge, kindergarten students correctly answered significantly fewer questions about these stories than those in second grade. Interestingly, the youngest children did no better on the explicit story forms than on the implicit forms. Hearing all the information about situations that were not highly familiar to them apparently did not help the kindergartners; these results are consistent with those obtained on the "unfamiliar" stories. If they lack requisite knowledge about an event, younger children's comprehension of a story about that event seemingly will suffer.

On the other hand, at the fourth- and sixth-grade levels, where knowledge of these situations was more complete, fewer errors were made on the explicit

story forms than on the implicit forms (one compared to eight). Having all essential information in a story aids comprehension for these older children. Again, these results correspond to those on the "unfamiliar" stories, which showed that the sixth graders did significantly better than any other group. Something more than existing knowledge may thus be required for comprehension of situations which are not isomorphic with a child's own experiences. Other data collected by this investigator indicate that the older children are more likely than the younger students: (1) to be aware that they have resources of their own to assist comprehension, (2) to use such resources, and (3) to increase their understanding if they do so. Cognitive skills such as these, then, may be needed for comprehension of all but the most highly familiar situations and may be among those abilities acquired during the elementary-school years.

The results of this study serve to suggest both the uses and limitations of existing knowledge in story comprehension. Knowledge about an event <u>does</u> make a difference, particularly with the younger children. Even kindergarten students can answer questions about the implicit forms of the familiar stories. Thus, they <u>look like</u> they are making inferences because they go beyond the information given. However, since these same kindergartners apparently do not operate on the explicitly provided information in stories about unfamiliar situations to enhance their understanding of them, they are not likely to be using deliberate inferential processes. Once they recognize that a story concerns something that they know, they may simply use their own knowledge - their own "scripts" - to supply, effortlessly, information that was omitted from the story itself.

These findings have several implications for education, particularly for reading instruction. The recommendation that instruction and instructional

material be adjusted to the skills and knowledge of individual children may be ignored as often as it is articulated. This study may suggest ways to follow this advice more effectively. One apparent conclusion is that even fairly young children can perform seemingly sophisticated cognitive operations, such as reconstructing relationships which are not explicitly stated, provided they can draw on their own knowledge of the situation to do so. Another is that, the more unfamiliar the topic of a story, the more difficulty students, especially younger ones, may experience comprehending it. Thus, semantics, not syntax nor sentence length, should perhaps be the primary consideration in the construction of beginning reading materials, especially when emphasis is being placed on the acquisition of word recognition skills. Stories about (personally) familiar situations may not only provide motivation for wanting to read, but they should also reduce task demands for children just learning to "break the code." Conversely, however, if children are expected to deal with material concerning topics with which they are not familiar, the assumption should not be made that they necessarily have the skills to do so. Particularly at the lower grades, deliberate pedagogical efforts may have to be made to help children learn to see the connections between ideas in a text.

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Table 1

Script-lists

Supermarket

- Get shopping cart
- Go up and down aisles to find things want to buy
- Put things selected in shopping cart
- When have everything want, go to line at check-out counter
- Take things to buy out of cart and put on counter
- Clerk tallies cost of each item and says how much have to pay
- Give clerk money (and get change)
- Clerk puts groceries, etc. in shopping bags
- Take shopping bags (to car) and go home

Peanut Butter-and-Jelly Sandwich

- Get things you need: 2 pieces of bread, jelly, peanut butter
- Get from place where kept (as kitchen cabinet)
- Peanut butter and jelly come in jars
- Open jars of peanut butter and jelly
- Put knife in peanut butter jar (or jelly)
- Spread peanut butter (or jelly) on piece of bread
- Put knife in jelly jar (or peanut butter)
- Spread jelly (or peanut butter) on other slice of bread
- Put both pieces of bread together (and eat)

Game of Checkers

- Put checkers on squares on board
- Checkers are round; one kind red, others are black; one color to each person
- Two people play; first one person moves a checker, then other person moves
- Can "jump" (name only)
- "Jump" if other person has checker in your line of move and empty space beyond; jump over and remove other person's checker from board
- If you reach other person's end of board, can get a "king"
- "King" (if possible): other person puts one of your checkers (taken from board) on top (double); king can move in any direction
- Win: One person takes all of other person's checkers from board or they can't move

Growing Vegetables in a Garden

- Buy or get seeds; vegetables (usually) grow from seeds
- Till or plow (loosen) soil (so can plant seeds)
- Plant seeds (in holes, rows, etc.)
- Cover seeds over with dirt
- Plants require sunshine to grow well
- Plants must be watered (if not enough rain)
- Pull out weeds
- Pick plants when ripe

Table 2

Means and Standard Deviations of Transformed Script Proportions by Grade, Situation, and Familiarity Level

Level		Kindergarten		Grade 2		Grade 4		Grade 6	
		M	SD	M	SD	M	SD	M	SD
I	S.M.	3.074	0.21	3.142	0.00	3.074	0.21	3.142	0.00
	P.B.	3.074	0.21	3.142	0.00	3.142	0.00	3.142	0.00
	Combined	3.074	0.21	3.142	0.00	3.108	0.15	3.142	0.00
II	Checkers	1.457	1.30	2.698	0.71	3.000	0.29	3.071	0.22
	Garden	1.759	0.52	2.260	0.48	2.646	0.33	3.000	0.29
	Combined	1.608	0.98	2.479	0.63	2.823	0.35	3.035	0.25

Note. Values listed are arc sine transformations of script proportions; perfect scores yield values of 3.142. S.M. = supermarket, P.B. = peanut butter-and-jelly sandwich.

Table 3

Means and Standard Deviations of Scores on "Unfamiliar" Stories by Grade and Story

Story	Kindergarten		Grade 2		Grade 4		Grade 6	
	M	SD	M	SD	M	SD	M	SD
Lye Soap	4.6	3.2	10.8	4.6	11.6	6.1	15.0	2.9
Lithograph	3.1	3.7	7.6	3.0	8.2	2.4	13.7	3.6

Note. Total possible score on each story was 20.